17. What is a solar cell? Discuss its working principle, applications, and the challenges in using solar cells for energy generation.

18. Discuss the importance of tide characteristics and statistics for tide energy technologies. How do these characteristics influence the design and efficiency of tide energy technologies?

19. Explain the physics and characteristics of the piezoelectric effect. How does it contribute to energy harvesting? Discuss the role of different materials in enhancing the piezoelectric effect.

20. Explain the working principle of batteries. Discuss their role in energy storage, their potential applications, and the challenges in using batteries for energy storage.

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APRIL/MAY 2024

23PSPH26 — RENEWABLE ENERGY AND ENERGY HARVESTING

Time : Three hours Maximum : 75 marks

SECTION A — (10 × 2 = 20 marks)

Answer ALL questions.

1. What are the main limitations of using fossil fuels and nuclear energy?

2. How does Tidal Energy work and what are its advantages?

3. What is a solar pond and how does it work?

4. What are the methods by which solar energy stored for later use?

5. What are the different types of wind turbines and what is the principle behind its working?

6. What are Osmotic Power and Ocean Bio-mass?

7. What are hydropower resources and how are they used in hydro energy production?

8. What is piezoelectric energy harvesting?

9. Explain the physics behind electromagnetic energy harvesting.

10. Discuss some recent applications of electromagnetic energy harvesting.

SECTION B — (5 × 5 = 25 marks)

Answer ALL questions.

11. (a) Discuss Wave Energy Systems. How do they work, and what are their potential benefits and drawbacks.

Or

(b) Explain the concept of Ocean Thermal Energy Conversion (OTEC). How does it contribute to renewable energy generation, and what are its limitations?

12. (a) Discuss the applications of solar ponds and solar energy in various sectors.

Or

(b) Explain the working principle of a solar water heater. How does it contribute to energy conservation?

13. (a) What are the components used in wind turbines? Discuss their roles and importance.

Or

(b) Compare the potential of ocean energy against wind and solar energy. Discuss the advantages and disadvantages of each.

14. (a) What are the environmental impacts of hydropower sources? Discuss both the positive and negative impacts.

Or

(b) Explain the concept of modeling piezoelectric generators. How does it help in improving the efficiency of these generators?

15. (a) Write short note on linear generators.

Or

(b) What are carbon capture technologies? Discuss their role in mitigating climate change and their potential applications.

SECTION C — (3 × 10 = 30 marks)

Answer any THREE questions.

16. Explain the process of biochemical conversion in the context of biomass energy. Discuss its efficiency and potential applications. Also, discuss the role of biomass energy in the future of renewable energy.